AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method of monitoring and measuring the volume of a liquid droplet as it is being discharged from a liquid dispensing system comprising a nozzle having a dispensing tip, the method comprising:

using the liquid to form at least part of one of the three components of a capacitor, namely, the dielectric and the two separate electrically conductive members; and

measuring the change in capacitance in the capacitor so formed as the liquid is discharged from the nozzle,

whereby the volume of liquid dispensed and the termination of the discharge may be recorded,

and further comprising:

electrically energising the liquid with AC current; and

measuring the capacitance induced in an electrically conductive member sited adjacent the tip as the liquid is being discharged from the nozzle.

2. (Cancelled)

3. (Original) A method as recited in claim 1, in which the liquid droplet forms one of the electrically conducting members of the capacitor.

4. (Original) A method as recited in claim 1, in which the liquid droplet forms a dielectric member positioned in the vicinity of electrically conducting members of the capacitor and altering the effective dielectric constant of the capacitor.

5. (Original) A method as recited in claim 1, in which when the liquid and nozzle are of high electrical conductivity, there is provided an electrode remote from and beneath the nozzle, the nozzle and electrode forming plates for the capacitor whereby the growth of a droplet on the dispensing tip increases the capacitance until it drops on detachment of the droplet from the dispensing tip.

6. (Original) A method as recited in claim 1, in which when the liquid is a water based liquid, the liquid is energised at a carrying frequency (f_o) of between 100 KHz and 5 MHz.

7. (Original) A method as recited in claim 1, in which when the liquid is a water based liquid, the liquid is energised at a carrying frequency (f_o) of between 0.1 KHz and 1 MHz.

8. (Original) A method as recited in claim 1, in which the liquid is energised with both AC and DC current and the volume of the liquid is calculated from both the change in capacitance and the charge carried by the liquid droplet.

9. (Original) A method as recited in claim 8, in which when the variance between the calculated volumes exceeds a preset amount, a possible malfunction is recorded.

10. (Original) A method as recited in claim 1, in which the initial calibration step is performed of: dispensing initially a plurality of droplets; measuring the change in capacitance; weighing the droplets; and storing the data for subsequent use.

11. (Original) A method as recited in claim 1, in which the liquid is delivered from the nozzle in a continuous jet and the jet forms separate droplets remote from the dispensing tip while still maintaining the jet, the method further comprising measuring the change in capacitance caused by the jet immediately before and after the formation of a droplet to determine the volume and other characteristics of the droplet.

12. (Original) A method as recited in claim 11, in which the information on the characteristics of the droplets is used to control the manner in which the jet is formed.

13. (Original) A method as recited in claim 1, in which when liquid is not being discharged from the apparatus, the capacitance is measured and monitored to provide an indication of a possible leak in the apparatus on a change in capacitance being detected.

14. (Original) A method of monitoring and measuring liquid discharged from a nozzle having a dispensing tip comprising:

electrically energising the liquid with AC current; and

measuring the capacitance induced in an electrically conductive member.

15. (Original) A method as recited in claim 14, in which when the liquid and nozzle are of high electrical conductivity, there is provided an electrode remote from and beneath the nozzle, the nozzle and electrode forming plates for the capacitor whereby the growth of a droplet on the dispensing tip increases the capacitance until it drops on detachment of the droplet from the dispensing tip.

16. (Original) A method as recited in claim 14, in which when the liquid is a water based liquid, the liquid is energised at a carrying frequency (f_o) between 100 KHz and 5 MHz.

17. (Original) A method as recited in claim 14, in which when the liquid is a water based liquid, the liquid is energised at a carrying frequency (f_o) between 0.1 KHz and 1 MHz.

18. (Original) A method as recited in claim 14, in which the liquid is energised with both AC and DC current and the volume of the liquid is calculated from both the change in capacitance and the charge carried by the liquid droplet.

19. (Original) A method as recited in claim 18, in which when the variance between the calculated volumes exceeds a preset amount, a possible malfunction is recorded.

20. (Original) A method as recited in claim 14, in which the initial calibration step is performed of: dispensing initially a plurality of droplets; measuring the change in capacitance; weighing the droplets; and storing the data for subsequent use.

21. (Original) A method as recited in claim 14, in which the liquid is delivered from the nozzle in a continuous jet and the jet forms separate droplets remote from the dispensing tip while still maintaining the jet, the method further comprising measuring the change in capacitance caused by the jet immediately before and after the formation of a droplet to determine the volume and other characteristics of the droplet.

22. (Original) A method as recited in claim 21, in which the information on the characteristics of the droplets is used to control the manner in which the jet is formed.

23. (Original) A method as recited in claim 14, in which when liquid is not being discharged from the apparatus, the capacitance is measured and monitored to provide an indication of a possible leak in the apparatus on a change in capacitance being detected.

24. (Original) A method of monitoring and measuring liquid as it is being discharged from a nozzle having a dispensing tip comprising:

siting the nozzle within a conductive chamber having an outlet to allow the passing of the liquid therethrough from the nozzle dispensing tip;

energising the liquid being dispensed by applying a voltage at a preset carrying frequency (f_o); and

measuring the capacitance induced by the interaction of the liquid and the chamber until the liquid detaches from the nozzle.

25. (Original) A method as recited in claim 24, in which when the liquid and nozzle are of high electrical conductivity, there is provided an electrode remote from and beneath the nozzle, the nozzle and electrode forming plates for the capacitor whereby the growth of a droplet on the dispensing tip increases the capacitance until it drops on detachment of the droplet from the dispensing tip.

26. (Original) A method as recited in claim 24, in which when the liquid is a water based liquid, the liquid is energised at a carrying frequency (f_o) between 100 KHz and 5 MHz.

27. (Original) A method as recited in claim 24, in which when the liquid is a water based liquid, the liquid is energised at a carrying frequency (f_o) between 0.1 KHz and 1 MHz.

28. (Original) A method as recited in claim 24, in which the liquid is energised with both AC and DC current and the volume of the liquid is calculated from both the change in capacitance and the charge carried by the liquid droplet.

29. (Original) A method as recited in claim 28, in which when the variance between the calculated volumes exceeds a preset amount, a possible malfunction is recorded.

30. (Original) A method as recited in claim 24, in which the initial calibration step is performed of: dispensing initially a plurality of droplets; measuring the change in capacitance; weighing the droplets; and storing the data for subsequent use.

31. (Original) A method as recited in claim 24, in which the liquid is delivered from the nozzle in a continuous jet and the jet forms separate droplets remote from the dispensing tip while still maintaining the jet, the method further comprising measuring the change in capacitance caused by the jet immediately before and after the formation of a droplet to determine the volume and other characteristics of the droplet.

32. (Original) A method as recited in claim 31, in which the information on the characteristics of the droplets is used to control the manner in which the jet is formed.

33. (Original) A method as recited in claim 24, in which when liquid is not being discharged from the apparatus, the capacitance is measured and monitored to provide an indication of a possible leak in the apparatus on a change in capacitance being detected.

34-40. (Cancelled)

41. (Withdrawn) A liquid droplet monitoring and measuring apparatus for use with a droplet dispenser of the type comprising a nozzle having a dispensing tip and means for delivering the liquid under pressure through the nozzle onto a receiving substrate, the apparatus comprising: an electrically conductive member; means for mounting the electrically conductive member adjacent the dispensing tip; means for electrically energising the liquid with AC current; and means for measuring the change in capacitance between the electrically conductive member and the liquid droplet as the liquid droplet is being formed on and subsequently detached from the dispensing tip.

42. (Withdrawn) Apparatus as recited in claim 41, in which the means for energising the liquid is a radio frequency (RF) oscillator.

43. (Withdrawn) Apparatus as recited in claim 41, in which the electrically conductive member comprises a cylindrical chamber.

44. (Withdrawn) Apparatus as recited in claim 43, in which the means for energising the liquid is a radio frequency (RF) oscillator.

45. (Withdrawn) Apparatus as recited in claim 41, in which the electrically conductive member comprises an open ended sleeve having an entrance for reception of the nozzle and an exit for discharge of a droplet.

46. (Withdrawn) Apparatus as recited in claim 41, in which the means for energising the liquid is a radio frequency (RF) oscillator.

47. (Withdrawn) Apparatus as recited in claim 41, in which the nozzle is electrically conductive and the electrically conductive member is mounted beneath the dispensing tip and spaced-apart therefrom.

48. (Withdrawn) Apparatus as recited in claim 47, in which the means for energising the liquid is a radio frequency (RF) oscillator.

49. (Withdrawn) Apparatus as recited in claim 41, in which there is provided additional means for energising the liquid with DC current and means for sensing when the droplet exits the apparatus.

50. (Withdrawn) A liquid droplet monitoring and measuring apparatus for use with a droplet dispenser of the type comprising a nozzle having a dispensing tip and means for delivering the liquid under pressure through the nozzle onto a receiving substrate, the apparatus comprising: a capacitor having spaced-apart electrically conductive members; means for mounting the capacitor adjacent the dispensing tip whereby the delivery of liquid out of the nozzle changes the dielectric constant of the capacitor; and means for measuring the change in capacitance of the capacitor as its dielectric changes under the influence of the liquid as it is dispensed.

51. (Withdrawn) Apparatus as recited in claim 50, in which the capacitor is formed from two spaced-apart electrically conductive plates.